versity Reporter for February 6, a very important proposal, which may lead to a considerable increase in the number of students resorting to Cambridge for advanced study or research. The Council recommends that statutory powers be obtained for the establishment of two new degrees, Bachelor of Science and Bachelor of Letters, to be conferred on graduates only, whether of Cambridge or of some recognised University, British or foreign. The conditions suggested are (1) matriculation, (2) residence for one academical year (three terms), (3) evidence of advanced study or research in Cambridge, (4) an original dissertation on some subject, literary or scientific, coming under the cognisance of one of the Special Boards of Studies. Hitherto only graduates of the Universities of Oxford and Dublin, who have fulfilled conditions as to residence equivalent to those in force at Cambridge, have been admissible to *ad eundem* degrees. The new proposal is much more liberal, and is calculated to attract some of those maturer students who now, after graduating in their own University, seek opportunities for higher work in the continental schools. As Cambridge graduates can qualify for the B.Sc. and B.Litt. degrees only if they have passed one of the higher Honours Examinations, and then only on submitting an approved original dissertation, it is plainly intended that these degrees shall imply a real distinction. It is interesting to note that literary or scientific research, and not the faculty of passing examinations, is a condition for the new "post-graduate" degree. At Oxford similar proposals are said to be afoot, and if the two older Universities carry through their scheme, a great step will have been taken towards making them once more the resort of scholars from all parts of the world.

The *Times* published on Tuesday a summary of the recommendations of the Gresham Commission on a Teaching University for London, embodying a scheme for its constitution, with visitor, chancellor, vice-chancellor, senate, academic council, convocation, and schools, and regulations as to examinations, faculties, boards of studies, and degrees.

SOCIETIES AND ACADEMIES.

London.

Royal Society, December 14.—"Action of Light on Bacteria.—Bacterial Photographs of the Solar and Electric Spectra." By Prof. H. M. Ward, F.R.S.

A thin film of gelatine or agar, in which spores or bacteria are evenly distributed, is spread over the flat bottom of a shallow glass dish. The lid of the dish is a plate of ground-glass, in which one or more slots, about ½ inch wide and 2½ inches long, are pierced. The spectrum is so arranged that the light-rays fall perpendicularly on the film carrying the spores &c., and can only reach the latter through the slots, all other parts of the plate being covered by tin foil and black paper.

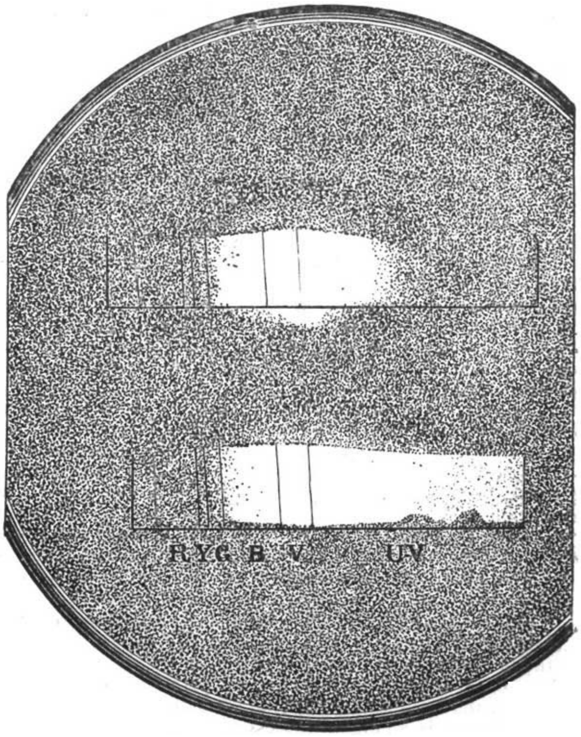
When the film has been thus locally exposed for a certain number of hours to the spectral rays, the culture is put into the incubator. All those parts protected from the light entirely, behave as in any ordinary culture—the spores germinate out and develop colonies, and the previously transparent film (transparent because the spores are too minute to affect it) becomes opaque.

Under the slot, however, the spores were exposed to the various rays of the successive regions of the spectrum. On one part of the exposed area the infra-red rays fall; on another the red; on another the orange; and so on with the yellow, green, blue, violet and ultra-violet rays.

If any of these rays kill or injure the spores they fall on, obviously the latter will show the effect by not germinating at all in the incubator, after exposure, or by germinating more or less slowly and feebly in comparison with the uninjured spores.

Wherever the spores do not germinate at all, the gelatine remains transparent; where they only germinate and develop into slowly growing, feeble colonies, the transparency of the gelatine film is merely clouded more or less; whereas, where they germinate and develop as vigorously as on the unexposed parts of the film, the latter is rendered quite opaque.

Obviously these differences, or contrast effects, can be photographed, and the following is a photograph of a plate treated as described.



In all cases so far examined, both the solar and electric spectra show that no action whatever is perceptible in the infra-red, red, orange, or yellow region, while all are injured or destroyed in the blue and violet regions.

The exact point when the action begins and ends is not the same in all the experiments, though very nearly so, but it must be reserved for the detailed memoir to discuss the various cases.

Broadly speaking, the action begins at the blue end of the green, rises to a maximum as we pass to the violet end of the blue, and diminishes as we proceed in the violet to the ultra-violet regions.

Some especially interesting results were obtained with the electric spectrum. In the first place, the results with glass prisms, lenses, &c., were so feeble that it was necessary to employ quartz throughout.

Secondly, the bactericidal effect is found to extend far into the ultra-violet. The intervention of a thin piece of glass results in the cutting off of a large proportion of effective rays.

These results suggest evidently that the naked arc light may prove to be a very efficient disinfecting agent in hospital wards, railway carriages, or anywhere where the rays can be projected directly on to the organism.

January 25.—"The Effect produced upon Respiration by Faradic Excitation of the Cerebrum in the Monkey, Dog, Cat, and Rabbit." By W. G. Spencer.

The effect upon respiration of exciting the cerebrum in a non-anæsthetised animal is probably a complex one, yet, by careful regulation of the anæsthetic state, four constant effects can be obtained upon respiration by stimulation of the cortex, and these can be traced down each in a course of its own from the cortex to the medulla oblongata.

A. *Diminution of Action.*

1. *Slowing and Arrest of the Respiratory Rhythm.*—The cortical area where this result was obtained is situated just outside the olfactory tract in front of the point where the tract joins the temporosphenoidal lobe. On exposing successive and vertical sectional surfaces of the hemisphere the same result was obtained by exciting in the line of the strand of fibres known as the olfactory limb of the anterior commissure. After decussating at the

anterior commissure, the tract is continued backwards on either side of the infundibulum into the red nucleus below and external to the aqueduct at the plane of exit of the third nerve.

B. *Increased Action.*

II. *Acceleration.*—Commencing from a point on the convex surface of the cortex within the "sensori-motor" area, the effect may be followed back just below the lenticular nucleus where it borders on the outer and ventral portion of the internal capsule; the strand runs at first external and then ventral to the motor portion of the internal capsule, and so reaches the tegmentum. The lines from the two sides meet in the interpeduncular grey matter at the level of and just behind the exit of the third nerve.

III. *Hyperinspiratory Clonus* ("snuffing movements").—This effect was obtained by excitation at the junction of the olfactory bulb and tract, and then carrying the stimulation backwards along the olfactory tract; the same result was found when the uncinate convolution of the temporo-sphenoidal lobe was irritated. Followed from the uncus this excitable region passed behind the optic tract to the crus, and then lay ventrally to the crusta. The excitable tract on each side thus converged towards the middle line at the upper border of the pons.

IV. *Hyperinspiratory Tonus.*—This experimental result is of such frequency and constancy as to be clearly an important general phenomenon. It can be elicited in various ways: *e.g.* excitation of the descending motor tract in the corona radiata and internal capsule yielded this result; so did excitation of the fifth nerve and dura mater, as well as the sciatic nerve, both before and after complete removal of the cerebrum at the tentorium cerebelli.

"Experimental Researches into the Functions of the Cerebellum." By Dr. J. S. Risien Russell, Assistant Physician to the Metropolitan Hospital.

This paper is based on experiments performed on dogs and monkeys, the results of which lead the author to conclude that the cerebellum is an organ whose one lateral half does not in any great measure depend on the cooperation of the other half for the proper performance of its functions. The bulk of the impulses pass from one half of the organ to the cerebrum, or spinal cord, without passing to the other half. Three factors are responsible for the defective movements which result on ablation of different parts of the organ—incoordination, rigidity, and motor paresis. The last of these is probably directly due to the withdrawal of the cerebellar influence from the muscles, while the exalted excitability of the opposite cortex cerebri, which results after unilateral ablation of the cerebellum, is probably a provision for compensation in this and other connections. The alteration in the excitability of the cerebral cortex was the most striking result obtained, for both as tested by the induced current directly applied to the cortex, and from the characters of the curves obtained from muscles on the two sides of the body, during general convulsions evoked by absinthe, the opposite cortex showed a greater degree of excitability than did that on the same side, owing, it appears, to an increased state of excitability of the cortical cells of the opposite cerebral hemisphere, and a diminished state of excitability of those on the same side. Further, the curves obtained from limb muscles showed that there was a marked alteration in the second stage of the convulsive seizure, on the side of a unilateral ablation of the cerebellum, or on both sides after total ablation of the organ, for the tonus characteristic of this stage of similar convulsions evoked in dogs whose central nervous system was intact was either replaced by clonic spasms, or a large element of clonus was superimposed on the tonus.

There is evidence that the one half of the cerebellum controls the cells of the cortex of the opposite cerebral hemisphere, and those of the anterior horns of the spinal cord on the same side chiefly, and on the opposite side to a slight extent. It is further suggested that either the cerebral hemisphere whose excitability is increased inhibits the opposite hemisphere, or that, under normal conditions, one half of the cerebellum inhibits the other half, which inhibition being no longer operative, owing to ablation of half of the organ, allows the remaining half to exert an increased control on the opposite cortex cerebri, or on the spinal centres of the same side, or possibly in both directions; but which is the most probable explanation of the phenomena observed is at present left an open question.

The symptoms which characterise ablation of different parts of the cerebellum are detailed; and it is urged that instead of looking on it as a distinct organ which has a special function, distinct from those subserved by other parts of the central nervous system, it would be more correct to look on it as a part of that system, having many functions in common with other parts of it, the chief difference between one part of this great system and another being the degree in which different functions are represented in any given part: *e.g.* with regard to motor power, the anterior extremity is maximally represented in the cerebrum and minimally in the cerebellum, whereas the trunk muscles are minimally represented in the cerebrum and maximally in the cerebellum. Arguments are adduced in favour of looking on the ocular deviations which result from ablation of parts of the cerebellum as paralytic rather than irritative phenomena, and two forms of nystagmus are recognised as consequent on cerebellar lesions, one which is spontaneous, and the other which is only evoked on voluntary movements of the globes, and the probable difference in their ætiology discussed. Finally, the phenomena characteristic of unilateral ablation of the cerebellum are contrasted with those the result of extirpation of the labyrinth, and it is shown that no single phenomenon is the same in the two.

"The Pathology of the Œdema which accompanies Passive Congestion." By Walter S. Lazarus-Barlow.

Physical Society, January 26.—Prof. A. W. Rücker, F.R.S., President, in the chair.—Mr. J. W. Kearton read a note on a new mode of making magic mirrors. The author's first idea was that the magic properties were due to differences in reflecting power, but experiments showed this to be improbable, and indicated that the patterns visible by reflected light were due to slight concavities in the surfaces. Several methods of producing such changes of curvature were tried, such as electro-depositing and electrical etching, the plates being subsequently polished to remove sharp edges. The method found most satisfactory was to draw the figures on polished brass covered with wax, and etch them by immersing in nitric acid, subsequently scouring with charcoal, Sheffield lime, and swansdown calico, until all direct traces of the figures disappeared. The scouring rounds off the edges and makes the depressions concave, the two eventually forming one concave sweep, which makes itself visible when light is reflected from it on a screen. To obtain satisfactory results with figures having broad and narrow lines, it was found necessary to paint over with hot wax the fine lines, and the outer edges of the broad ones after the first immersion; a second immersion etched the middle parts of the broad lines deeper. By repeating the process the broad lines were etched roughly concave in steps, and the scouring made their curvature continuous. Figures in relief, showing the pattern in shade on reflection, were obtained by painting the pattern on the plate in sealing-wax dissolved in naphtha, and etching away the uncovered portions by an immersion of one or two seconds. A number of mirrors with patterns in intaglio and relief were exhibited to the meeting. Prof. S. P. Thompson said the chief interest of Mr. Kearton's work was that he had succeeded in producing mirrors by a process which Prof. Ayrton had found unsuccessful. The spherical polisher used by Mr. Kearton might have something to do with the result obtained. Some of the mirrors had been gilt after polishing, and the reflected pattern improved thereby. Prof. Ayrton said he was greatly interested to see that mirrors could be produced by the chemical method. The polisher used by the Japanese was the flat end of a tight bundle of special straw cut crosswise. When the true explanation of the magic properties was found out, the chemical method was not pursued further. The Rev. F. J. Smith mentioned that he had produced magic properties on silvered glass by the inductoscript method. Although no markings could be seen directly, the pattern showed itself when light was reflected from the surface to a screen.—Mr. W. B. Croft read a paper on some observations in diffraction, and exhibited a large number of photographs of diffraction figures obtained under different conditions. The first series exhibited, related to diffraction from parallel light (diffraction of Fraunhofer and Schwerd), and were obtained by placing various combinations of thin circular lines of light on a dark glass plate before the object-glass of a telescope focussed on a star. Spectral images of the star are formed by interference from the edges of the lines, thus giving diffraction patterns whose form depends on the shape of the aperture employed. The next series illustrated diffraction in shadow (Fresnel's diffraction), and were produced by condensing light on a minute pinhole, and placing the object between the hole and a microscope eyepiece. Beyond the eyepiece the camera used for photographing the phenomena was placed. Permanent records of remarkably good diffraction figures were obtained in this way, both of the combinations of circles above mentioned and of various other objects and geometrical forms. After showing geometrically that diffraction bands from narrow obstacles and openings were wider than those from broader ones, the author explained the conditions necessary for making the bands visible, and pointed out the distinction between internal and external bands. Prominent amongst the photographs were several showing "Arago's white spot" at the middle of a shadow, and, in particular, this well-known phenomenon was shown as produced by so large an object as a threepenny-piece. Speaking of diffraction in a microscope, the author said little doubt need exist as to whether an image represented the real object or a diffraction modification thereof, for the latter were usually of a more misty and complicated character. Departing somewhat from the subject of diffraction, an excellent photograph of conically refracted pencils was shown, consisting of circular lines of light produced by passing light from pinholes through a crystal of arragonite. Dr. Johnstone Stoney thought the obtaining of permanent records of diffraction phenomena of great importance, and was particularly interested in the photograph showing conical refraction. Prof. S. P. Thompson said he had never seen diffraction effects exhibited to an audience so well before. He had noticed that in several of the photographs Arago's spot was unintentionally shown to perfection in the shadow of dust particles. The President greatly appreciated the fact that the conical refraction photograph had been exhibited for the first time before the Physical Society.—A note on a new photometric method and a photometer for same, was read by Mr. J. B. Spurge. The method consists in using two diffusing screens (illuminated respectively by the lights to be compared) as secondary sources, and adjusting to equality the luminosity of equidistant internal surfaces by varying the apertures through which the light passes from the screens to those surfaces. By reducing the sizes of the apertures the author has been enabled to compare lights of different colour, for when of sufficiently feeble intensity coloured lights are indistinguishable from white or grey. The photometer is made up of two tubes mounted at 45° to an axis, about which one of them is capable of rotating. When in the same horizontal plane, the axes of the tubes form the sides of an isosceles right-angled triangle, at the middle of whose hypothenuse the light to be tested is placed; this illuminates one of the screens, whilst the standard light shines on the other. These screens, used as secondary sources, are situated a short distance away from the outer ends of the tubes, whilst the inner surfaces of the near ends of the tubes are viewed by means of a mirror. By turning the movable tube about the inclined axis, and rotating the source about a vertical axis, the illuminating effect of the source in any direction can be tested. Capt. Abney said the law of inverse squares was not true for weak lights, for the proportions in which the light from sources of equal intensity had to be reduced to appear white or grey depended greatly on the colour; being much greater for violet than for red. Only for the yellow-green rays was the ordinary law of illumination true when the intensities were feeble. Mr. Blakesley, Prof. S. P. Thompson, and the President also took part in the discussion.

Geological Society, January 24.—W. H. Hudleston, F.R.S., President, in the chair.—The ossiferous fissures in the valley of the Shode, near Ightham, Kent, by W. J. Lewis Abbott. The fissures occur in a promontory of Kentish Rag between two tributaries of the Shode. There are four fissures in this promontory, striking at right angles to the valley. Details of the physiography of the area in which the fissures occur are given in the paper. Three of the fissures have obviously been in contact with the surface, and from these the bones appear to have been dissolved out. The fourth does not reach the top of the Rag, and further is sealed by an arragonite-lined chamber with stalactitic floor and ceiling. This fissure is from 2 to 6 feet wide and about 80 feet deep, and is filled with a heterogeneous collection such as constitutes the flotsam and jetsam of streams, along with materials derived from the rock in which the fissures occur. Several thousand bones were found, also twelve species of aquatic and land shells, an entomostracan, *Chara* and other vegetable remains have been procured. The author gave reasons for concluding that the fissures have never been reopened since they were first closed by the materials introduced into them by the river, and that all the contained fossils belong to one and the same geological period. He pointed to the discovery of species not before found in Pleistocene beds as only a repetition of what has occurred in other sections he had worked, and remarked also that the increase of species was corroborative of a suggestion of Mr. C. Reid that the more we discover of the smaller creatures of this and the preceding age, the more they approximate to those of our own times. Even if we were to exclude from the lists all the species not previously found fossil elsewhere, we still have an extensive assemblage of the older Pleistocene forms, which must have lived during the filling of the fissures, and this therefore fixes the filling operation as having occurred in Pleistocene times.—The vertebrate fauna collected by Mr. Lewis Abbott from the fissure near Ightham, Kent, by E. T. Newton, F.R.S. The vertebrate remains collected by Mr. Lewis Abbott have been passed in review by Mr. Newton, and as far as possible specifically identified: they represent mammals, birds, reptiles, and amphibians; but no fishes have been found. In all, 48 different forms have been recognised; 3 or perhaps 4 are extinct; 11 are extinct in Britain, but are still living elsewhere; 21 are living in Britain, but are known to be Pleistocene or forest-bed forms; and 12 are species now living in Britain which have not hitherto been recognised in Pleistocene or older deposits. Among the more important species found in this fissure, but extinct in Britain, may be noticed, besides *Elephas primigenius*, *Rhinoceros antiquitatis*, and *Hyæna*, the *Ursus arctos*, *Canis lagopus*, *Myodes torquatus*, *Myodes lemmus*, *Microtus gregalis*, *M. ratticeps*, *Lagomys pusillus*, *Spermophilus*, and *Cervus tarandus*. The name of *Mustela robusta* was proposed for some limb-bones intermediate between the polecat and marten, and the remains of an extremely small weasel are noticed as a variety of *Mustela vulgaris*. Although the large number of living species gives a recent aspect to this series of remains, the evidence, it is believed, points rather to their being all of Pleistocene age, and most nearly allied to the fauna of British caves. In the course of some remarks upon the paper, Mr. Topley compared the fissures filled with loam and gravel, and containing mammalian bones and land-shells, of the Maidstone district with the interesting example described, and explained that those of the Maidstone Rag country were connected with overlying deposits of drift, the material now filling the fissures having been let down into the rock by solution of the limestone along joints and cracks. Sir Henry Howorth and Dr. Henry Hicks also spoke, and Mr. E. T. Newton briefly replied.

Paris.

Academy of Sciences, January 29.—M. Lœwy in the chair.—An account of the work of A. Scacchi, by M. Des Cloizeaux.—Integration of the equation of sound for an indefinite fluid in one, two, or three dimensions, when there are different resistances to the movement; physical consequences of this integration, by M. J. Boussinesq.—On the propagation of an electric current in a particular case, by M. A. Potier.—Anomalies in the force of gravity observed on the North American Continent, by M. Defforges. The value of *g* for a number of stations between Washington and San Francisco is as follows:—Washington 980·167, Montreal 980·729, Chicago 980·345, Denver 979·684, Salt Lake City 979·816, Mt. Hamilton 979·683, and San Francisco 980·016. These values, reduced to sea-level and compared with the theoretical values calculated from Clairaut's law, show regular anomalies which are compared with anomalies exhibited by oceanic islands.—Theory of the elasticity of metals, by M. Félix Lucas.—On the new measurement of the area of France, by General Derrécagaix. A planimeter measurement, calculated on the assumption that the figure of the earth is a true ellipsoid of revolution. Supplementary remarks were made by M. E. Levasseur.—On the rapid summation of certain slightly convergent series (alternate harmonic series), by M. A. Janet.—On a common property of three particular classes of rectilinear congruences, by M. Alphonse Demoulin.—Joule's and Mariotte's laws in connection with existing gases, by M. Jules Andrade. The author shows that these laws are true for real gases within about the same limits of accuracy.—An electric alarm thermometer for laboratory ovens, by M. Barillé. Connection of an electric circuit is made when the mercury in the thermometer reaches a determined point on the scale by means of a platinum wire which is attached to a small iron tube (sliding along a fixed wire), of which the position can be regulated by a magnet attached to the supporting frame.—On synthesised borneols, by MM. G. Bouchardat and J. Lafont.—Thermal constants of some polyatomic bases, by MM. Albert Colson and Georges Darzens. For *ethylene-diamine* the observed values were:—Specific heat 0·84 between 12° and 45°; heat of solution +7·6 cal. for 1 mol. in 4 litres of water at 15°; heat of neutralisation +23·54 cal. (1 mol. normal salt in 5 litres of water); heat of solution of the normal chloride −7·55 cal. for 1 mol. in 4 litres of water. For quinine, observations gave:—Heat of solution for 1 mol. of $Q.SO_4H_2.6H_2O$ dissolved in 12 litres of water containing 1 mol. $H_2SO_4 = -6·7$ cal.; heat of neutralisation +15·5 cal. for freshly precipitated quinine.—On the adaptation of the alcoholic ferment to the conditions of living in media containing hydrofluoric acid, by M. E. Sorel. The lactic acid ferment is destroyed by the addition to the mash of a small quantity of hydrofluoric acid, and the yield of alcohol correspondingly increased. By cultivation in presence of increasing quantities of hydrofluoric acid the resisting properties of the alcoholic ferment may be considerably increased.—On the relation of the palisade tissue of leaves to transpiration, by M. Pierre Lesage. The palisade tissue appears to function as a means of protecting the leaves from excessive transpiration.—Main lines indicating directions of folds and contortions in the geology of France, by M. Marcel Bertrand.—On the composition of some calcareous marls, by M. H. le Chatelier.—On the forms of platinum in its bed rock, from the Ural district, by M. A. Inostranzeff.—On the age of the human skeleton discovered in the eruptive formation of Gravenoire (Puy-de-Dôme), by MM. Paul Girod and Paul Gautier.

BERLIN.

Physical Society, Dec. 15, 1893.—Prof. du Bois Reymond, President, in the chair.—Dr. A. du Bois Reymond spoke on Lilienthal's experiments on flying. As a starting-point he had chosen the study of the flight of birds, which may be divided into three distinct kinds—flapping, steering, and soaring. Of these the one demanding least expenditure of energy is soaring, and investigation showed that under certain conditions flight is possible if the wind possesses a vertical component. Experiments showed that surfaces can acquire a horizontal motion by the action of the wind only, when their curvature bears a certain relation to their superficies, and that this relation corresponds exactly to that which is observed in the wings of birds. Dr. Lilienthal's flying machine consists of a correctly curved surface whose area is 14 square metres, made by stretching linen over a light wooden frame, and having a weight of about 20 kilos. In its centre is an aperture for the experimenter's body, and the apparatus is held in position by the person's arms. On running rapidly down a gentle slope of a hill against the wind, the latter soon acquires a vertical component, which then carries the flying apparatus and propels it in a direction against the wind. The speaker had seen Dr. Lilienthal sail over a space of about 120 metres, at an altitude of some 30 metres, in a minute; with a favourable wind it was possible to cover some 200 to 500 metres, and Dr. du Bois Reymond had himself taken leaps through the air of 20 to 30 metres under similar conditions. He was of opinion that by practice far better results may be obtained as regards soaring, and that then, by combining steering with soaring, it will be possible to fly even when the wind is unfavourable. It appears that the three essentials for the solution of the problem of flight are (1) correct utilisation of the wind; (2) the correct shape of the supporting surfaces, and (3) correct handling of the apparatus.—Herr Haensch explained three different models of Nicol prisms, of which Glans' showed itself to be best as regards construction and efficiency.

January 5.—Prof. Kundt, President, in the chair.—Dr. Lummer gave a detailed account of the experiments he had made, before his journey to Chicago, on Siemen's and on Violle's unit of light. Both of these must be rejected as standard-units in cases where the platinum is melted in the blowpipe flame. Experiments made to establish the Violle unit by means of an electric current showed that in this case there were variations of from 10 to 12 per cent., which made it unsuitable as an absolute standard of light. Hefner's amylacetate lamp, which the speaker had been examining during the last four years, gives a unit which varies only by some 3 or 4 per cent. as long as the necessary conditions are strictly observed and allowance is made for varying meteorological conditions which affect the lamp. It appears, therefore, that a really reliable unit of light has still to be found.

January 19.—Prof. Kundt, President, in the chair.—Prof. Hale, of Chicago, exhibited and explained his lantern-slides of solar photographs.—Prof. Neesen communicated on behalf of Herr van Aubel, of Brussels, the latter's method of silvering aluminium. It consists in cleaning the plate of aluminium with benzol, then dipping it into a solution of sulphate of copper until a thin film of copper is formed on its surface. At this stage a layer of silver is deposited electrolytically on the plate. Prof. Neesen had found that the layer of silver thus formed does not adhere very firmly to the aluminium.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—A Students' Text-Book of Botany: Dr. S. H. Vines, first half (Sonnenschein).—Johnston's Elements of Agricultural Chemistry, revised by C. M. Aikman, 17th edition (Blackwood).—Optical Experiments, revised and arranged after the directions of Dr. H. Zwick (Newmann).—The Inventions, Researches, and Writings of Nikola Tesla: T. C. Martin (New York, *Electrical Engineer* Office)—Electricity in the Service of Man: Dr. R. Wormell, revised and enlarged by Dr. R. M. Walmsley (Cassell).—A Text-book of Euclid's Elements: H. S. Hall and F. H. Stevens, Books 2 and 3 (Macmillan).—Pain, Pleasure, and Æsthetics: H. R. Marshall (Macmillan).—Primer of Philosophy: Dr. P. Carus (Chicago, Open Court Publishing Co.).—The Religion of Science: Dr. P. Carus, extra edition (Chicago, Open Court Publishing Co.).—Investigations on Microscopic Forms and on Protoplasm: Prof. O. Bütschli, translated by E. A. Minchin (Black).—Congrès Internationaux d'Anthropologie et d'Archéologie préhistorique et de Zoologie à Moscou, Matériaux, Deux Partie (Moscou). Two Great Scotsmen the Brothers William and John Hunter: Dr. G. R. Mather (Glasgow, J. Maclehose).

PAMPHLETS.—Report of J. P. Langley, Secretary of the Smithsonian Institution, for the year ending June 30. 1893 (Washington).—Seventh Annual Report of the Liverpool Marine Biological Committee and their Biological Station at Port Erin: Prof. Herdman (Liverpool, Dobb).—Über ein Interferenzrefractometer: L. Mach (Wien).—Physical Constants of Thallium: W. H. Steele (Melbourne).—A New Thermoelectric Phenomenon: W. H. Steele (Melbourne).—On the Conductivity of a Solution of Copper Sulphate: W. H. Steele (Melbourne).—Sulle Perturbazioni Magnetiche dell' Agosto 1893, &c.: Dr. L. Palazzo (Roma).

SERIALS.—Bulletin de l'Académie Royale des Sciences de Belgique, 63^e Année, No. 12 (Bruxelles).—Dictionary of Political Economy, sixth part (Macmillan). Natural Science, February (Macmillan).—Botanical Gazette, January (Madison, Wis). Proceedings of the Society for Psychical Research, January (K. Paul).—L'Anthropologie, Tome iv. No. 5 (Paris, Masson).—Geological Magazine, February (K. Paul).—Quarterly Journal of the Geological Society, Vol. l. part 1, No. 197 (Longmans)—Bulletin of the New York Mathematical Society, January (New York, Macmillan).—American Naturalist, January (Philadelphia).

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